

CLAIMS

What is claimed is:

1. A hydrogen storage tank comprising:

an outer cylinder; and

at least one cylindrical hydrogen storage module positioned within the outer cylinder, the at least one cylindrical hydrogen storage module having an outer diameter smaller than an inner diameter of the outer cylinder wherein a hydrogen passage is formed between an inner peripheral surface of the outer cylinder and the at least one cylindrical hydrogen storage module,

each cylindrical hydrogen storage module comprising:

a laminate including a plurality of adjacent hydrogen storage units filled with hydrogen absorption materials, the laminate having a hydrogen absorption and desorption surface on at least a part of an outer peripheral surface of the laminate,

at least one heating/cooling elements positioned between adjacent ones of the hydrogen storage units;

at least one main passage that passes through the laminate in a lamination direction of the hydrogen storage units parallel to a longitudinal axis of the outer cylinder, wherein heating fluid and cooling fluid pass through the at least one main passage; and

sub passages that branch from the at least one main passage in a direction perpendicular to the longitudinal axis and extend over within each of the heating/cooling elements.

2. The hydrogen storage tank according to claim 1, wherein the sub passages comprise a plurality of guide members that circulate the heating fluid and cooling fluid throughout the sub passages.

3. The hydrogen storage tank according to claim 2, wherein the heating fluid comprises hydrogen for burning and oxygen and each of the heating/cooling elements include a catalyst that facilitates a burning reaction of the hydrogen burned with the oxygen.

4. The hydrogen storage tank according to claim 3, wherein the at least one main passage comprises a first main passage that permits the hydrogen for burning to flow therethrough and a second main passage that permits the oxygen to flow therethrough, wherein the sub passages include a first sub passage situated on one of opposite sides of a porous carrier that holds the catalyst and communicates with the first main passage and a second sub passage situated on the other side of the porous carrier and communicates with the second main passage, wherein each cylindrical hydrogen storage module has a discharge passage that communicates with the second sub passage.

5. The hydrogen storage tank according to claim 4, wherein each hydrogen storage unit comprises a plurality of fins embedded within the powdery hydrogen absorption material and contacting the heating/cooling elements.

6. The hydrogen storage tank according to claim 2, wherein the heating fluid is a mixed gas of hydrogen and oxygen, and wherein the heating/cooling elements include a catalyst that facilitates a burning reaction of the mixed gas.

7. The hydrogen storage tank according to claim 6, wherein the at least one main passage includes first and second main passages that permit the mixed gas to flow

therethrough, wherein the sub passages include a first sub passage situated on one of opposite sides of a carrier that holds the catalyst and communicates with the first and second main passages and a second sub passage situated on the other side of the carrier and communicates with the first and second main passages, wherein each cylindrical hydrogen storage module comprises a discharge passage that communicates with the first and second sub passages.

8. The hydrogen storage tank according to claim 7, wherein each hydrogen storage unit further comprises a plurality of fins embedded in the powdery hydrogen absorption material to contact the heating/cooling elements.

9. A hydrogen storage tank comprising:

an outer cylinder; and
a cylindrical hydrogen storage section positioned within the outer cylinder, the cylindrical hydrogen storage section having an outer diameter smaller than an inner diameter of the outer cylinder wherein a hydrogen passage is formed between an inner peripheral surface of the outer cylinder and the cylindrical hydrogen storage section, the cylindrical hydrogen storage section having a hydrogen absorption and desorption surface on at least a part of an outer peripheral surface of the cylindrical hydrogen storage section,

the cylindrical hydrogen storage section comprising:

a hydrogen absorption material aggregate; and
a fluid passage provided in the hydrogen absorption material aggregate to permit heating fluid and cooling fluid to flow therethrough.

10. The hydrogen storage tank according to claim 10, wherein the fluid passage comprises a plurality of straight passages along a longitudinal axis of the cylindrical

hydrogen storage section, and a plurality of diverging/converging passages between adjacent ones of the straight passages, wherein the diverging/converging passages diverge fluid from one straight passage toward an entire outer periphery of the cylindrical hydrogen storage section and then converge the fluid toward another straight passage.

11. The hydrogen storage tank according to claim 10, wherein adjacent ones of the diverging/converging passages are arranged to generate heat accumulation therebetween.

12. The hydrogen storage tank according to either one of claim 10 or 11, wherein the heating fluid is hydrogen for burning and oxygen and the diverging/converging passages are provided with a catalyst that facilitates a burning reaction of the hydrogen for burning with the oxygen.

13. The hydrogen storage tank according to claim 11, wherein the heating fluid is a mixed gas of hydrogen and oxygen and the diverging/converging passages have a catalyst that facilitates a burning reaction of the mixed gas.

14. A hydrogen storage tank comprising:

an outer cylinder;

a hydrogen absorption material aggregate positioned in the outer cylinder; and

a fluid passage provided in the hydrogen absorption aggregate that permits heating fluid and cooling fluid to flow therethrough,

wherein the fluid passage comprises:

a plurality of straight passages along a longitudinal axis of the outer cylinder; and

a plurality of diverging/converging passages between adjacent ones of the straight passages that diverge the fluid from one straight passage toward an entire outer

periphery of the outer cylinder and then converge the fluid toward another straight passage.